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Total Number of Pages : 02

B.Tech
PCI5I103

5th Semester Regular / Back Examination 2018-19

WATER SUPPLY & SANITARY ENGINEERING

BRANCH : CIVIL

Time : 3 Hours

Max Marks : 100

Q.CODE : E213

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Short Answer Type Questions (Answer All-10) (2 x 10)

- In meandering rivers, the intake should not be located on sharp curves, why?
- State the assumptions and limitations of Dupuit's theory.
- Why coli form organisms are called indicator organism?
- Show that depth has no role in the design of a sedimentation tank.
- Write the advantage of horizontal flow sedimentation tank over a vertical upflow sedimentation tank?
- What type of Pump will you recommend for Lifting water from deep well.
- What do you mean by Specific yield and Specific retention? Write the relation between them w. r. t. porosity.
- "Coagulation process in sewage treatment is uneconomical". Justify the statement.
- "Normally sewer runs partially" Justify the statement
- For the same solid content, if the quantity of sludge with moisture content of 98% is V, then what will be the quantity of sludge with moisture content of 96%?
- Discuss the effect of pH and temperature in sludge digestion.

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any EIGHT out of TWELVE) (6 x 8)

- List the factors that govern the selection of a site for intake structure?
- A town having a population of 1.2lakhs is to be supplied with water from a reservoir 5km away. It is stipulated that half the daily supply of 200lphd will have to be delivered in 8hrs; what should be the size of the supply main if the head available in 16mts. Take the value of C for the main as 100 and use Hazen-William formula?
- Describe the principle and working of Centrifugal Pump? Classify various type of Centrifugal Pump.
- What are the requirements of a good distribution system? Discuss with neat sketches the various types of layout of distribution systems.
- Discuss the role of wash water trough in rapid sand filter with detailed figure.
- To treat 4.54 Mld water, bleaching powder containing 30% chlorine is used. A dose of 0.4 mg/l of chlorine is used to maintain a residual of 0.1 mg/l. Compute amount of bleaching powder necessary
- Mention any three methods of Softening of water. Describe "Base Exchange" process of softening water in detail.
- Differentiate between Conservancy system and Water Carriage system of Sanitation. Write their Advantages and Disadvantages.
- Calculate the ratio of discharge of a sewer when flowing at full depth to that of when flowing at half depth.
- A town discharges 40 m³/s of secondary treated sewage into a stream having a rate of flow 1000 m³/s. The DO content of sewage is 1 mg/L and DO in upstream side of river is 8.5 mg/L. Find the DO of mix.

- k) Draw a flow diagram of two stages High rate Trickling and explain the working principle.
- l) Discuss the need for sludge treatment and explain the various stages of sludge treatment.

Part-III

Long Answer Type Questions (Answer Any TWO out of FOUR)

- Q3**
- Explain the term "Storage Coefficient" and "Coefficient of Transmissibility". (2)
 - Briefly explain different type of Aquifer with figure. (4)
 - Gravity well has a diameter of 60cm. The depth of water in the well is 40 metres before pumping is started. When the pumping is being done at the rate of 2000 litres per minute, the drawdown in a well 10 metres away is 4 metres and in another well 20 metres away is 2 metres. Determine (a) radius of zero drawdown. (b) Coefficient of permeability. (c) Drawdown in the well. (d) Specific capacity of the well. (e) maximum rate at which water can be pumped from the well. (10)
- Q4**
- Show that the settling velocity of spherical particle in a liquid under condition when Reynolds's number is less than 0.5 may be given by expression: $V_s = \frac{g(G-1)d^2}{18\nu}$, where G is specific gravity of the particle. Write the assumptions also. (6)
 - A rapid sand filter is to be provided in a water treatment plant, to process the water for a town with a population of 2,00,000. The water demand is 200litres/capita/day. The rate of filtration is $15\text{m}^3/\text{m}^2/\text{hour}$. Allow 5% of filtered water for storage to meet the backwash requirements. Each backwashing period is of 30 min. Determine the number of filters required allowing one as a stand by unit. The available surface area configuration of filter unit is 8m x 4m. Also compute the up-flow velocity and headloss to expand the bed to 0.66m from its original undistributed depth of 0.6m. The porosity of the bed is 0.50. The specific gravity is 2.5. The average particle size is 0.6mm. The drag coefficient is 5.02. The flow is assumed to be transition flow (10)
- Q5**
- What do you mean by "Self purification" of stream? Draw a neat sketch of an oxygen sag curve and explain the salient features. (6)
 - Bring out the difference between self cleansing velocity and non-scouring velocity. (10)
- A 30 cm diameter sewer having an invert slope of 1 in 150 was flowing full. What would be the velocity of flow and discharge? ($n=0.013$). Is the velocity self cleansing? What would be the velocity and discharge when the same is flowing at 0.20 and 0.8 of the full depth.
- Q6**
- Define and differentiate between suspended and attached growth process. (4)
 - Design a high rate trickling filter from the following data : (12)
- Design flow : 60 ML/d
 Recirculation ratio: 1:2
 BOD of primary treated sewage: 270 mg/L
 Desirable effluent BOD : 20 mg/L